

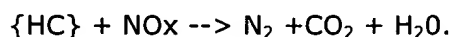
**Remarks/Arguments:**

With this amendment, the applicant cancels claim 13. Claims 9-12, 14-18, 21-32, 34, and 35 are pending. In view of the amendments and the remarks below, the applicant submits that the pending claims are not rendered obvious in light of the prior art cited in the present Office Action. The applicant respectfully submits the pending claims are now in a condition for allowance and requests early notification to that effect.

**I. The Inventive Subject Matter**

The present invention is directed to an emission control system for a lean-burn internal combustion engine incorporating a lean NOx catalyst system, an oxidation catalyst system, and means for injecting hydrocarbon fuel to the lean NOx catalyst system.

Lean NOx catalysis is the use of a hydrocarbon catalytically to reduce NOx in an exhaust gas. A typical reaction scheme is as follows:



Practical lean NOx catalysts for use in treating internal combustion engine exhaust gas include Pt/Al<sub>2</sub>O<sub>3</sub> and Cu/ZSM-5 (a zeolite, i.e. an aluminosilicate). In Lean NOx catalysis, the HC reductant preferentially reacts with oxygen. NOx conversion is thus improved by increasing the selectivity of the catalyst for reacting HC with NOx instead of O<sub>2</sub>.

The techniques of lean NOx catalysis and NOx absorption differ markedly: a lean NOx catalyst can be formulated so that it contains virtually no material which promotes NOx absorption. A typical lean NOx catalyst, therefore, could not function as a NOx absorber. Furthermore, in using a NOx absorber, reductant is injected only intermittently; on the other hand, in lean NOx catalysis, in the absence of a reductant, NOx reduction will not occur (see the reaction scheme above).

## **II. The Office Action**

The applicant appreciates the Examiner's consideration of the supplemental amendment of March 10, 2004.

The present Office Action objects to claim 13 under 37 C.F.R. § 1.75 as substantially a duplication of claim 12. The Office Action rejects claims 9-16, 21-30, 34, and 35 under 35 U.S.C. § 103(a) as obvious over Tsuchitani et al. (EP 0 666 099) in view of Remeika et al. (U.S. 4,001,371). The Office Action cites excerpts of Tsuchitani et al. and Remeika et al. that disclose space velocity and its relationship to catalyst reactivity as suggesting to one of ordinary skill in the art to select and appropriate volume for the lean NOx catalyst system relative to the oxidation catalyst system. Moreover, the Office Action states that one of ordinary skill in the art would have considered the volume ratio a result effective variable.

The Applicant submits that the Office Action rejection is in error. The applicant submits that the Office Action has mischaracterized Tsuchitani et al. In addition, the applicant submits that the combination of Tsuchitani et al. and Remeika et al. do not teach each and every limitation of the presently claimed invention. The applicant respectfully requests reconsideration of the Office Action in view of the arguments set forth below.

### **A. Claim Objections**

The applicant has cancelled claim 13 and submits that the Office Action objection regarding claim 13 is now moot.

### **B. Mischaracterization of Tsuchitani et al.**

#### **1. Disclosure of Tsuchitani et al.**

Tsuchitani et al. is directed to providing a method which is capable of efficiently removing NOx from gas in an oxidizing atmosphere with an oxidizing component, an absorbing component, and an auxiliary component. (page 8, lines 41-44; page 4 lines 1 and 2). Tsuchitani et al. teaches using a NOx trap, not a lean NOx catalyst. In fact, Tsuchitani et al. distinguishes lean NOx catalyst technology in its background art section.

More Specifically, in making a distinction between lean NO<sub>x</sub> catalyst technology and a NO<sub>x</sub> absorber, Tsuchitani et al., at page 3, line 27-5, discusses lean NO<sub>x</sub> catalysis, and gives examples of specific lean NO<sub>x</sub> catalysts. Also, Tsuchitani et al. highlights the problem of selectivity towards combustion of HC reductant in O<sub>2</sub> (see page 3, lines 48-51). In fact, Tsuchitani et al. dismisses (and therefore distinguishes) lean NO<sub>x</sub> catalysis in favor of absorbing NO<sub>x</sub> on a NO<sub>x</sub> absorber (lithium, potassium etc.) in lean conditions, i.e. in the absence of reductant, and then intermittently regenerating the NO<sub>x</sub> absorber by contacting it with a reductant (see page 5, lines 23-30; page 6, line 26; page 6, line 54-page 7, line 1, for example).

2. Applicant's Claim 9, element a) and Tsuchitani et al. page 7, line 47-55

The Office Action cites page 7, line 47-55 of Tsuchitani et al. as disclosing element a) of claim 9 which recites "a lean NO<sub>x</sub> catalyst system comprising a lean NO<sub>x</sub> catalyst platinum group metal (PGM) for reducing NO<sub>x</sub> to N<sub>2</sub> wherein the lean NO<sub>x</sub> catalyst PGM consists of platinum." The applicant respectfully submits that the Office Action has mischaracterized the citation of Tsuchitani et al.

The paragraph of page 7, lines 47-55 refers to a "catalyst" without mention of its oxidizing or reducing capabilities. The proceeding paragraph, beginning on line 56 of page 7, clarifies which catalyst Tsuchitani et al. is referring, stating, "In the components mentioned above [lines 47-55], such Nobel metals as platinum . . . are effective to oxidize NO<sub>x</sub> in an oxidizing atmosphere." Because element a) of claim 9 of the present invention is directed to a platinum catalyst for reducing NO<sub>x</sub> and the citation of Tsuchitani et al. discusses a platinum *oxidation* catalyst, the applicant submits that this citation of Tsuchitani et al. is in error.

3. Applicant's Claim 9, element b) and Tsuchitani et al. page 9, line 38-44

The Office Action cites page 9, line 38-44 of Tsuchitani et al. as disclosing element b) of claim 9 which recites "an oxidation catalyst system comprising an oxidation catalyst platinum group metal (PGM) for oxidizing hydrocarbons and carbon monoxide, disposed downstream from the lean NO<sub>x</sub> catalyst system." The applicant respectfully submits that the Office Action has again mischaracterized the citation of Tsuchitani et al. There is no disclosure in the cited

passage of Tsuchitani et al. that the oxidation catalyst oxidizes hydrocarbons and carbon monoxide as recited in element b) of claim 9. Nor is there disclosure in the cited passage that a lean NO<sub>x</sub> catalyst system is disposed downstream of an oxidation catalyst. The applicant submits that the Office Action is in error.

### **C. Non-obviousness**

The nonobvious differences between the claimed invention and Tsuchitani et al. have been discussed above. Tsuchitani et al. does not disclose or suggest a lean NO<sub>x</sub> catalyst system comprising a lean NO<sub>x</sub> catalyst platinum group metal (PGM) for reducing NO<sub>x</sub> to N<sub>2</sub> or an oxidation catalyst system comprising an oxidation catalyst platinum group metal (PGM) for oxidizing hydrocarbons and carbon monoxide, disposed downstream from the lean NO<sub>x</sub> catalyst system. The catalytic process as taught by Remeika et al. fails to fill that void. Because the combination of Tsuchitani et al. and Remeika et al. do not recite each and every limitation of the claimed invention, their combination cannot be said to render the claimed invention obvious. See MPEP § 2143. The applicant respectfully requests reconsideration.

## **II. Conclusion**

In view of the above, the applicant respectfully submits that the pending claims are in a condition for allowance. The Office Action has mistakenly mischaracterized the teaching of Tsuchitani et al. when forming the obviousness rejection. Therefore, the combination of Remeika et al. and Tsuchitani et al. fails to teach each and every claim limitation recited in claim 1, and do not render the claims obvious.

The applicant requests a personal interview with the applicant's undersigned representatives if such action will expedite the prosecution of the application or if the Examiner has any suggestions or questions concerning the application or the present Response. The applicant's representatives will call the Examiner two weeks from the date of this Office Action to schedule the interview. If the claims of the application are not believed to be in full condition for allowance, for any reason, the applicants respectfully request the constructive assistance and suggestions of the Examiner in drafting one or more acceptable claims pursuant to MPEP § 707.07(j) or in making constructive suggestions pursuant to MPEP § 706.03 so that the

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application can be placed in allowable condition as soon as possible and without the need for further proceedings.

Respectfully submitted,



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